CLAIMS

1. A method for storing hydrogen in a hybrid form, comprising coupling and using within a single tank at least two hydrogen storage means selected from the group consisting of :

a) means for storing hydrogen in a gaseous form ;
b) means for storing hydrogen in a liquid form ; and
c) means for storing hydrogen in a solid form by absorption or adsorption,

with the proviso that each of the means for storing hydrogen that are used, is sized to store at least 5% by weight of the total amount of hydrogen stored within the tank.

2. The method according to claim 1, wherein the means that are coupled and used, include said means for storing hydrogen in a gaseous form and said means for storing hydrogen in solid form with a metal hydride.

3. The method according to claim 2, wherein the metal hydride has an equilibrium plateau pressure higher than 40 bar at the operating temperature of the tank.

4. The method according to claim 3, wherein the hydride is a Ti- or alanate (AlH_x) based hydride.

5. The method according to claim 1, wherein the means that are coupled and used, include said means for storing hydrogen in a liquid form and said means for storing hydrogen in a solid form with a metal hydride.

6. A hybrid tank for storing hydrogen in both liquid and solid forms, comprising two concentric containers, one of said containers hereinafter called "inner container" being located within the other one which is hereinafter called "outer container", said containers being separated by an insulating sleeve for maintaining the inner container at low temperature, said inner container being used for storing hydrogen in a liquid form, said outer container being in direct communication with the inner container and containing a metal hydride for storing hydrogen in a solid form.

7. The hybrid tank according to claim 6, wherein the hydride that is used in the outer container is an hydride having low equilibrium plateau pressure at the operating temperature of the tank.

8. The hybrid tank according to claim 7, wherein the hydride that is used is selected from the group consisting of $NaAlH_4$, $LiAlH_4$, $LaNi_5H_6$ and MgH_2.

9. The hybrid tank according to claim 6, wherein the hydride within the outer container is an hydride having a high equilibrium plateau pressure at the operating temperature of the tank.

10. The hybrid tank according to claim 9, wherein the hydride is selected from the group consisting of $TiCr_{1.8}$, $TiMn_{2-y}$, Hf_2Cu, Zr_2Pd, $TiCu_3$ and $V_{0.855}Cr_{0.145}$.

11. A hybrid tank for storing hydrogen in both solid and gaseous forms, comprising:

- a container having a metallic liner or inner wall covered with a polymeric outer shell, said container being devised to store hydrogen in gaseous form at a high pressure and to receive and store a metal hydride in order to also store hydrogen in solid form;
- at least one heat pipe mounted in the container to allow circulation of a heat carrying fluid within said container; and
- a heat exchanger located within the container in order to ensure

thermal connection between said at least one heat pipe and the hydride.

12. The hybrid tank according to claim 11, wherein:

- the container is cylindrical and provided with an axial opening;

- the tank comprises only one of said at least one heat pipe which is inserted into the container through the opening thereof and extends axially within said container; and

- the heat exchanger consists of at least one element selected from the group consisting of metallic grid, fibers or porous metallic structure extending transversally within the container, each of said at least one grid being in direct contact with the axial heat pipe, the metallic liner of the container and the hydride.

13. The hybrid tank according to claim 12, wherein the hydride that is used in the outer container is an hydride having low equilibrium plateau pressure at the operating temperature of the tank.

14. The hybrid tank according to claim 13, wherein the hydroxide that is used is selected from the group consisting of $NaAlH_4$, $LiAlH_4$, $LaNi_5H_6$ and MgH_2.

15. The hybrid tank according to claim 12, wherein the hydride within the outer container is an hydride having a high equilibrium state at the operating temperature of the tank.

16. The hybrid tank according to claim 15, wherein the hydride is selected from the group consisting of $TiCr_{1.8}$ $TiMn_{2-y}$, Hf_2Cu, Zr_2Pd, $TiCu_3$ and $V_{0.855}Cr_{0.145}$.